

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A datagram relaying apparatus comprising:

a plurality of protocol terminating units;

and

a destination determining processor which comprises:

a path selecting section which determines a transfer destination route for each stream identifier of a stream of packets received from any of said protocol terminating units, wherein said path selecting section determines whether or not transfer of said received stream of packets to said transfer destination route is in an inhibition state, and selects another transfer destination route when the transfer of the packet to said transfer destination route is in the inhibition state.
2. (original): A datagram relaying apparatus according to claim 1, wherein said path selecting section determines said transfer destination route or said another transfer destination route based on a load distribution ratio previously set for each said transfer destination route.

3. (currently amended): A datagram relaying apparatus according to claim 2, wherein said path selecting section manages ~~the~~a stream count being currently allocated and ~~the~~a maximum stream count to be allocated, for each said transfer destination route, and determines whether or not the transfer of said received steam of packets to said transfer destination route is in the inhibition state, based on comparison between the stream count being currently allocated and the maximum stream count to be allocated.

4. (original): A datagram relaying apparatus according to claim 3, wherein said path selecting section determines that the transfer of said received stream of packets to said transfer destination route is in the inhibition state, when the stream count being currently allocated is greater than the maximum stream count to be allocated.

5. (original): A datagram relaying apparatus according to claim 4, wherein said path selecting section determines whether or not the transfer of said received stream of packets to said another transfer destination route is in the inhibition state, when determining said another transfer destination route for said received stream of packets.

6. (currently amended): A datagram relaying apparatus according to claim 1, wherein said path selecting section manages ~~the~~a stream count being currently allocated and a maximum stream count to be allocated, for each said transfer destination route, and determines whether or

not the transfer of said received stream of packets to said another transfer destination route is in the inhibition state, based on the comparison between the stream count being currently allocated and the maximum stream count to be allocated.

7. (currently amended): A datagram relaying apparatus according to claim 1, wherein said path selecting section manages ~~the~~a stream count being currently allocated and ~~the~~a maximum stream count to be allocated, for each said transfer destination route, and determines that the transfer of said received stream of packets to said another transfer destination route is in the inhibition state when the stream count being currently allocated is equal to or greater than the maximum stream count to be allocated.

8. (original): A datagram relaying apparatus according to claim 1, wherein said path selecting section monitors whether or not a fault has occurred on said transfer destination route, and assigns a stream of packets allocated to said transfer destination route to said another transfer destination route when said fault has occurred on said transfer destination route.

9. (original): A datagram relaying apparatus according to claim 8, wherein said path selecting section manages whether or not said fault has occurred, for every transfer destination route, and determines said another transfer destination route based on said faults managed for the respective transfer destination routes.

10. (original): A datagram relaying apparatus according to claim 9, wherein said path selecting section manages the transfer destination routes individually based on single data.
11. (original): A datagram relaying apparatus according to claim 1, wherein said path selecting section determines said another transfer destination route based on a predetermined order.
12. (currently amended): A datagram relaying apparatus according to claim 1, wherein said path selecting section manages a maximum stream count to be continuously allocated, for each said transfer destination route, and continuously determines said another transfer destination routes for said received stream of packets ~~of packets~~ to the maximum stream count to be continuously allocated, and then determines still another transfer destination route for another received stream of packets.
13. (original): A datagram relaying apparatus according to claim 1, wherein said path selecting section changes said transfer destination route each time said transfer destination route is determined.
14. (currently amended): A datagram relaying apparatus according to claim 1, wherein said path selecting section manages ~~the~~ a stream count being currently allocated and ~~the~~ a maximum

stream count to be allocated, for each said transfer destination route, and after continuously allocating said another transfer destination routes until the stream count being currently allocated reaches the maximum stream count to be allocated, determines a still another transfer destination route.

15. (currently amended): A datagram relaying apparatus according to claim 1, wherein said path selecting section calculates an allocation rate of ~~the~~a stream count being currently allocated to a load distribution ratio for each said transfer destination route, and determines said transfer destination route having the smallest allocation rate as said another calculation result, when determining said another transfer destination route for said received stream of packets~~-packets~~.

16. (currently amended): A datagram relaying apparatus according to claim 1, wherein said path selecting section manages ~~the~~a stream count being currently allocated and ~~the~~a maximum stream count to be allocated, for each said transfer destination route, and determines said transfer destination route having the smallest value when the stream count being currently allocated is divided by the maximum stream count to be allocated, as said another transfer destination route.

17. (original): A datagram relaying apparatus according to claim 1, wherein said path selecting section discards a correspondence between said transfer destination route and said received stream of packets when a packet does not arrive for a predetermined time.

18. (original): A datagram relaying apparatus comprising:
- a plurality of protocol terminating units;
 - a destination address extracting section which extracts a destination address data to determine a transfer destination route from a header data of a packet received from any of said protocol terminating units;
 - a stream identifier calculating section which calculates a stream identifier to identify a stream from said header data of the packet received from any of said protocol terminating units;
 - a route determining section which determines
 - a multi-path identifier to uniquely identify a transfer path serving or a plurality of transfer destination routes as said transfer destination route, based on said destination address data;
 - a cache transfer path number memory which stores said stream identifier and said multi-path identifier in an address portion, and stores as a cache transfer path number, a transfer path number corresponding to said transfer path, based on a combination of said stream identifier and said multipath identifier in a data portion;
 - a cache table accessing section which reads out said cache transfer path number corresponding to said combination of said stream identifier and said multi-path identifier from said cache transfer path number memory;
 - a transfer inhibition bit string memory which stores said multi-path identifier in an address portion, and stores in a data portion, a transfer inhibition bit string indicating whether or not transfer of the received stream of packets to said transfer path corresponding to said

combination of the transfer path number and said multi-path identifier, for each said transfer path number, based on said multi-path identifier;

a transfer allocation path number memory which stores said multi-path identifier in an address portion, and stores in a data portion, said transfer path number corresponding to said transfer path as a transfer allocation path number, based on said multipath identifier;

a transfer path memory which stores said multi-path identifier and said transfer path number in an address portion, and stores said transfer path in a data portion, based on said combination of said multipath identifier and said transfer path number;

a path selecting section which determines said transfer path serving as said transfer destination route for said received stream of packets, based on said multi-path identifier and said cache transfer path number; and

an output section selector which transfers said received stream of packets to said transfer path,

wherein said destination address extracting section outputs said destination address data to said route determining section, said stream identifier calculating section outputs said stream identifier to said cache table accessing section and said path selecting section, said route determining section outputs said multi-path identifier to said cache table accessing section and said path selecting section;

said cache table accessing section outputs said cache transfer path number to said path selecting section, and

said path selecting section defines said cache transfer path number as said transfer path number, and reads out said transfer inhibition bit string based on said multi-path identifier, and determines whether or not the transfer of the packets to said transfer path corresponding to the combination of said transfer path number and said multi-path identifier is in an inhibition state based on the read out transfer inhibition bit string, and when the transfer of the packets to said transfer path is in the inhibition state, reads out said transfer allocation path number based on said multi-path identifier, and updates said transfer path number from said cache transfer path number to said read out said transfer allocation path number, and outputs said transfer path corresponding to said combination of the updated said transfer path number and said multi-path identifier to said output device selecting section.

19. (original): A datagram relaying apparatus according to claim 18, further comprising an allocation inhibition bit string memory which stores said multi-path identifier in an address portion, and stores in a data portion, an allocation inhibition bit string indicating whether or not allocation of said received stream of packets to said transfer path corresponding to said combination of the transfer path number and said multi-path identifier is in the inhibition state, for each said transfer path number, based on said multi-path identifier, wherein said path selecting section reads out said allocation inhibition bit string based on said input said multi-path identifier, when updating said transfer path number from said cache transfer path number to said transfer allocation path number, and specifies said transfer path number in which allocation of said received stream of packets is not in the inhibition state in the read out allocation inhibition

bit string, and then updates said transfer allocation path number corresponding to said multipath identifier in said data portion of said transfer allocation path number memory, based on the specified transfer path number.

20. (original): A datagram relaying apparatus according to claim 18, further comprising:
an allocation stream count memory which storing said multi-path identifier and said transfer path number in an address portion, and storing in a data portion an allocation stream count indicating the stream count being currently allocated to said transfer path number, based on said combination of said multi-path identifier and said transfer path number; and

a maximum stream count memory when stores said multi-path identifier and said transfer path number in an address portion, and stores in a data portion, a maximum stream count indicating the maximum stream count to be allocated to said transfer path number, based on said combination of said multi-path identifier and said transfer path number,

wherein said path selecting section reads out said allocation stream count and said maximum stream count based on said combination of said transfer path number based on said input said cache transfer path number and said input said multi-path identifier, and compares the read out allocation stream count with said maximum stream count, and when said allocation stream count is greater than said maximum stream count, stores a fact that transfer of said received stream of packets to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is in an inhibition state in said transfer inhibition bit string, and when said allocation stream count is equal to or less than said maximum stream

count, stores a fact that the transfer of the packet to said transfer path corresponding to said combination of said multi-path identifier and

said transfer path number is in a permission state in said transfer inhibition bit string.

21. (original): A datagram relaying apparatus according to claim 18, wherein said path selecting section stores a fact that the allocation of said received stream of packets to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is in the inhibition state in said allocation inhibition bit string when said allocation stream count is equal to or greater than said maximum stream count, and stores a fact that the allocation of the stream to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is at the permission state in said allocation inhibition bit string, when said allocation stream count is less than said maximum stream count.

22. (original): A datagram relaying apparatus according to claim 20, wherein said path selecting section subtracts one from said allocation stream count corresponding to said combination of said multi-path identifier and said transfer path number corresponding to said cache transfer path number, when updating said transfer path number from said cache transfer path number to said transfer allocation path number, and further adds one to said allocation stream count corresponding to the combination of said multi-path identifier and said transfer path number after said update, and compares said subtracted allocation stream count and said added allocation stream count with said maximum stream count, and updates said transfer inhibition bit

string and said allocation inhibition bit string based on the comparison result, and specifies said transfer path number to update said transfer allocation path number stored in said transfer allocation path number memory, based on the updated transfer inhibition bit string and said allocation inhibition bit string.

23. (original): A datagram relaying apparatus according to claim 19, wherein said path selecting section defines a start value as a value next to a value of said transfer allocation path number in which said transfer path number is updated, and said path selecting section specifies said transfer path number in which the allocation of said received stream of packets is not in the inhibition state based on said allocation inhibition bit string, and then sequentially determines whether or not the allocation of said received stream of packets to said transfer path corresponding to a combination of said multi-path identifier and said transfer path number is in a permission state in said allocation inhibition bit string, and defines a value targeted for a next determination as a minimum value of said transfer path number, when a value targeted for the determination becomes a maximum value of said transfer path number in the determination, and determines whether or not the allocation of the stream to said transfer path corresponding to the combination of said multi-path identifier and said transfer path number is in the permission state in said allocation inhibition bit string.

24. (original): A datagram relaying apparatus according to claim 23, wherein said path selecting section sets said transfer path number to update said transfer allocation path number

corresponding to said multipath identifier in said transfer allocation path number memory as a transfer path number corresponding to said start value, when the value targeted for said determination becomes the same value as said transfer allocation path number in which said transfer path number is updated.

25. (original): A datagram relaying apparatus according to claim 20, wherein said path selecting section reads out said allocation stream count and said maximum stream count for each said transfer path number based on said multi-path identifier, when specifying said transfer path number in which the allocation of said received stream of packets is not in the inhibition state based on said transfer allocation path number, and divides the read out allocation stream count by said maximum stream count to calculate an allocation rate for each said transfer path number, and then updates said transfer allocation path number stored in said transfer allocation path number memory based on said transfer path number having the smallest allocation rate.

26. (original): A datagram relaying apparatus according to claim 19, further comprising: a continuous allocation count memory which stores said multi-path identifier in an address portion, and stores in a data portion, a continuous allocation count indicating the stream count continuously allocated to said transfer path number until this time, based on said multi-path identifier; and

a maximum continuous allocation count memory which stores said multi-path identifier and said transfer path number in an address portion, and stores a maximum continuous allocation

count indicating the maximum stream count continuously allocated to said transfer path number in a data portion, based on said combination of said multi-path identifier and said transfer path number, wherein said path selecting section adds one to said continuous allocation count corresponding to said multi-path identifier, after updating said transfer path number based on said transfer allocation path number read out from said transfer allocation path number memory, and compares the added continuous allocation count with said maximum continuous allocation count, and specifies said transfer path number in which the allocation of said received stream of packets is not in the inhibition state in said allocation inhibition bit string corresponding to said multi-path identifier, when said continuous allocation count is equal to or greater than said maximum continuous allocation count, and then updates said transfer allocation path number corresponding to said multi-path identifier in said data portion of said transfer allocation path number memory based on the specified transfer path number.

27. (original): A datagram relaying apparatus according to claim 19, wherein said path selecting section updates said transfer allocation path number corresponding to said multi-path identifier in said data portion of said transfer allocation path number memory, each time said path selecting section updates said transfer path number from said cache transfer path number based on said transfer allocation path number read out from said transfer allocation path number memory.

28. (original): A datagram relaying apparatus according to claim 20, wherein said path selecting section updates said transfer allocation path number corresponding to said multi-path identifier in said data portion of said transfer allocation path number memory, when said allocation stream count corresponding to said transfer allocation path number stored in said transfer allocation path number memory reaches said maximum stream count.

29. (original): A datagram relaying apparatus according to claim 18, further comprising: a channel identifier memory which stores a channel identifier corresponding to said transfer path in a one-to-one correspondence relationship in an address portion, and stores said multi-path identifier and said transfer path number in a data portion, based on said channel identifier;

an operation mode memory which stores said multi-path identifier in an address portion, and stores an operation mode indicating whether or not a fault has occurred on a physical link corresponding to said transfer path in a data portion, based on said multi-path identifier; and

a transfer path state bit string memory which stores said multi-path identifier in an address portion, and stores in a data portion, a transfer path state bit string indicating whether or not the allocation of said received stream of packets and the transfer of said received stream of packets to said transfer path corresponding for each said transfer path number are in the inhibition state because of said fault occurrence, based on said multi-path identifier,

wherein said path selecting section specifies said channel identifier corresponding to said transfer path corresponding to said physical link having said fault from a fault occurrence report signal, when said fault occurrence report signal reporting said fault

occurrence is received from said physical link, and specifies said transfer path number and said multipath identifier corresponding to the specified channel identifier from said channel identifier memory, and updates said operation mode corresponding to the specified multi-path identifier to a fault occurrence state, and further stores the fact that the allocation of said received stream of packets and the transfer of said received stream of packets to said specified transfer path number are in the inhibition state in said transfer path state bit string corresponding to said specified multi-path identifier, reads out said operation mode corresponding based on said multi-path identifier received from said route determining section, when said stream is received from said protocol terminating unit, reads out said transfer path state bit string based on said multi-path identifier, when the read out operation mode indicates the fault occurrence state, and determines whether or not the allocation and transfer of said received stream of packets to said transfer path number are in the inhibition state in the read out said transfer path state bit string, and reads out said transfer allocation path number based on said multi-path identifier, when the allocation of said received stream of packets and the transfer of the stream to said transfer path number are in the inhibition state, and updates said transfer path number to the read out transfer allocation path number based on said cache transfer path number, and outputs said transfer path corresponding to said combination of the updated transfer path number and said multi-path identifier to said output device selecting section.

30. (original): A datagram relaying apparatus according to claim 29, wherein said path selecting section reads out said transfer path state bit string based on said multi-path identifier,

when the read out operation mode indicates the fault occurrence state based on said input said multi-path identifier, and specifies said transfer path number in which the allocation and transfer of said received stream of packets are not in the inhibition state in the read out transfer path state bit string, and then updates said transfer allocation path number corresponding to said multipath identifier in said data portion of said transfer allocation path number memory based on the specified said transfer path number.

31. (original): A datagram relaying apparatus according to claim 18, further comprising a usage path bit string memory which stores said multi-path identifier in an address portion, and stores a usage path bit string indicating one or more of said transfer paths corresponding to the multi-path identifier in a data portion, based on said multi-path identifier, wherein said transfer path number corresponds to each of said transfer paths different from each other in a one-to-one relationship, and said transfer path number is further constituted of the same data as the corresponding transfer path, said path selecting section stores said transfer path state bit string indicating whether or not the allocation and transfer of said received stream of packets to each transfer path number and each transfer path are in the inhibition state, and specifies said transfer path corresponding to said physical link having said fault from said fault occurrence report signal when said fault occurrence report signal reporting said fault occurrence is received from said physical link, and stores a fact that the allocation and transfer of said received stream of packets to the specified transfer path are in the inhibition state in said transfer path state bit string, and reads out the corresponding usage path bit string based on said multi-path identifier received

from said route determining section, when said received stream of packets is received from said protocol terminating units, and determines presence or absence of said transfer path which is used in the read out usage path bit string and in which the allocation and transfer of said received stream of packets are in the inhibition state in said transfer path state bit string, and determines whether or not the allocation and transfer of said received stream of packets to said transfer path number corresponding to said cache transfer path number received from said cache table accessing section are in the inhibition state based on said transfer path state bit string, in the case of the presence of said transfer path which is used in said usage path bit string and in which the allocation and transfer of said received stream of packets are in the inhibition state in said transfer path state bit string, and reads out said transfer allocation path number based on said multi-path identifier, when the allocation and transfer of said received stream of packets to said transfer path number are in the inhibition state, and updates said transfer path number based on the read out transfer allocation path number based on said cache transfer path number, and then outputs the updated transfer path number to said output device selecting section, and

said output device selecting section transfers said received stream of packets based on said transfer path number received from said path selecting section.

32. (original): A datagram relaying apparatus according to claim 31, wherein said path selecting section specifies said transfer path number in which the allocation and transfer of said received stream of packets are not in the inhibition state in said transfer path state bit string, in the case of the presence of said transfer path and said transfer path number which are used in said

usage path bit string and in which the allocation and transfer of said received stream of packets the packet are in the inhibition state in said transfer path state bit string, and updates said transfer allocation path number corresponding to said multi-path identifier in said data portion of said transfer allocation path number memory based on the specified transfer path number.

33. (original): A datagram relaying apparatus according to claim 18, wherein said cache transfer path number further has a bit different from a bit indicating the corresponding transfer path number,

the different bit stores therein a registration state bit indicating whether or not said cache transfer path number received from said cache table accessing section is at a non-registered state, and

said path selecting section determines whether or not said received cache transfer path number is in a non-registered state based on said different bit, and updates said transfer path number from said cache transfer path number to said transfer allocation path number when said cache transfer path number is in the non-registered state.

34. (original): A datagram relaying apparatus according to claim 18, wherein said path selecting section stores a predetermined bit pattern, said cache transfer path number is composed of said predetermined bit pattern, when said transfer path number corresponding to said combination of said stream identifier and said multi-path identifier is in the non-registered state, and

said path selecting section determines whether or not said cache transfer path number received from said cache table accessing section is composed of said predetermined bit pattern, and determines whether or not said cache transfer path number is in the non-registered state, and updates said transfer path number from said cache transfer path number to said transfer allocation path number when said cache transfer path number is in the nonregistered state.

35. (original): A datagram relaying apparatus according to claim 18, wherein said path selecting section outputs the specified transfer path number as an update path number to said cache table accessing section, after specifying said transfer path number to update said transfer allocation path number stored in said transfer allocation path number memory, and said cache table accessing section updates said cache transfer path number corresponding to said combination of said multi-path identifier and said stream identifier in a data portion based on said update path number, when said update path number is received.

36. (original): A datagram relaying apparatus according to claim 18, wherein said transfer inhibition bit string is composed of the number of bits equal to or greater than kinds of said transfer path numbers divided by the corresponding multi-path identifier, and in each of the respective bits constituting said transfer inhibition bit string, each of the respective bits corresponds to said transfer path number divided by said multi-path identifier in a one to-one relationship, and a fact is stored indicating that the transfer of said received stream of packets to

said transfer path corresponding to said corresponding said transfer path number for each said bit is in the inhibition state.

37. (original): A datagram relaying apparatus according to claim 19, wherein said allocation inhibition bit string is composed of the number of bits equal to greater than kinds of said transfer path numbers divided by the corresponding said multi-path identifier, and in each of the respective bits constituting said allocation inhibition bit string each of the respective bits corresponds to said transfer path number divided by said multi-path identifier in a one to-one relationship, and a fact is stored indicating that the allocation of said received stream of packets to said transfer path corresponding to said corresponding said transfer path number for each said or bit is in the inhibition state.

38. (original): A datagram relaying apparatus according to claim 29, wherein said transfer path state bit string is composed of the number of bits equal to or greater than kinds of said transfer path numbers divided by the corresponding said multi-path identifier, and in each of the respective bits constituting said transfer path state bit string, each of the respective bits corresponds to said transfer path number divided by said multi-path identifier in a one to-one relationship, and a fact is stored indicating that the allocation and transfer of said received stream of packets to said transfer path corresponding to the corresponding transfer path number for each said bit are in the inhibition state.

39. (original): A datagram relaying apparatus according to claim 31, wherein said transfer path state bit string is composed of the number of bits equal to or greater than kinds of said transfer path numbers, and

in each of the respective bits constituting said transfer path state bit string, each of the respective bits corresponds to said transfer path and said transfer path number in a one-to-one relationship, and a fact is stored indicating that an allocation and transfer of said received stream of packets to said corresponding said transfer path and said transfer path number for each said bit are in the inhibition state.

40. (original): A datagram relaying apparatus according to claim 33, further comprising an aging processing section which detects said combination of said transfer path number and said multi-path identifier corresponding to said transfer path to which said received stream of packets is not transferred for a predetermined time, and sets said cache transfer path number stored in said data portion of said cache transfer path number memory corresponding to said combination of said transfer path number and the detected said multi-path identifier, to the nonregistered state.

41. (original): A datagram relaying apparatus according to claim 40, wherein said path selecting section subtracts one from said allocation stream count corresponding to said detected combination of said transfer path number and said multi-path identifier to which said received stream of packets is not transferred for said predetermined time, and updates said transfer

inhibition bit string and said allocation inhibition bit string, based on the subtracted allocation stream count and said maximum stream count.

42. (original): A datagram relaying method comprising:

receiving a stream of packets; and

determining a transfer destination route for each stream identifier of said received stream of packets,

wherein said step of determining a transfer path includes:

determining whether or not the transfer of said received stream of packets to the determined transfer destination route is in an inhibition state, when said transfer destination route for said received stream of packets; and

determining another transfer destination route, when the transfer of said received stream of packets to said transfer destination route is in the inhibition state.

43. (original): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining said transfer destination route or said another transfer destination route based on a load distribution ratio preliminarily set for each said transfer destination route.

44. (currently amended): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining whether or not the transfer of said received stream of packets to said transfer destination route is in the inhibition state, based on a comparison between ~~the~~a stream count being currently allocated and the maximum stream count to be allocated, which are managed for each said transfer destination route.

45. (currently amended): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining that the transfer of said received stream of packets to said transfer destination route is in the inhibition state, when ~~the~~a stream count being currently allocated is greater than the maximum stream count to be allocated.

46. (original): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining whether or not allocation of said received stream to said another transfer destination route is in the inhibition state.

47. (currently amended): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining whether or not the allocation of said received stream of packets to said another transfer destination route is in the inhibition state, based on the comparison between ~~the~~a stream count being currently allocated and the maximum stream count to be

allocated, which are managed for each said transfer destination route, when said another transfer destination route is determined for. said received stream of packets.

48. (currently amended): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining that the allocation of said received stream of packets to said another transfer destination route is in the inhibition state, when ~~the~~a stream count being currently allocated which is managed for each said transfer destination route is equal to or greater than the maximum stream count to be allocated which is managed for each said transfer destination route.

49. (original): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

allocating said received stream allocated to said transfer destination route having a fault to said another transfer destination route, when said fault has occurred on said transfer destination route.

50. (original): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining said another transfer destination route based on said fault occurrence managed for each said transfer destination route, when said another transfer destination route is determined.

51. (original): A datagram relaying method according to claim 42, wherein said transfer destination route is managed individually based on each single data.

52. (original): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining said another transfer destination route based on a preset predetermined order.

53. (currently amended): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

continuously determining said another transfer destination route for said received stream of packets until arrival of ~~the~~a maximum stream count to be continuously allocated, which is managed for each said transfer destination route; and

then, determining still another transfer destination route for said received stream.

54. (original): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

changing said transfer destination route every time, when said another transfer destination route is determined for said received stream of packets.

55. (original): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

continuously determining said still another transfer destination routes, until the stream count being currently allocated which is managed for each said transfer destination route reaches the maximum stream count to be allocated which is managed for each said transfer destination route.

56. (currently amended): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

calculating an allocation rate of ~~the~~a stream count being currently allocated to said load distribution ratio for each said preset said transfer destination route, when said another transfer destination route is determined for said received stream of packets; and

determining said transfer destination route having the smallest allocation rate as said another transfer destination route.

57. (currently amended): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

determining as said another transfer destination route, said transfer destination route having the smallest value when ~~the~~a stream count being currently allocated which is managed for each said transfer destination route is divided by the maximum stream count to be allocated

which is managed for each transfer destination route, when said another transfer destination route is determined for said received stream of packets.

58. (original): A datagram relaying method according to claim 42, wherein said step of determining a transfer path includes:

discarding a correspondence between said received stream of packets and said transfer destination route for said stream in which a packet does not arrive for a predetermined time.

59. (original): A datagram relaying method comprising:

extracting a destination address data from header data of each of received packets of a stream to determine a transfer destination route;

calculating a stream identifier to identify said stream from said header data of said packet;

determining a multi-path identifier to uniquely identify a transfer path serving as said transfer destination route, or a plurality of transfer destination routes, based on said destination address data;

reading out said cache transfer path number from a cache transfer number memory for storing said stream identifier and said multi-path identifier in an address portion based on a combination of said stream identifier and said multi-path identifier and storing as a cache transfer path number, a transfer path number corresponding to said

transfer path in a data portion based on said combination of said stream identifier and said multi-path identifier;

determining a transfer path serving as said transfer destination route, based on said multi-path identifier and said cache transfer path number, by using a transfer path memory for storing said multipath identifier and said transfer path number in an address portion, and for storing said transfer path in a data portion based on said combination of said multi-path identifier and said transfer path number; and

transferring said received stream of packets to said transfer path,
wherein said step of determining a transfer path includes:

defining said cache transfer path number as said transfer path number;

reading out a transfer inhibition bit string, based on said multi-path identifier, from a transfer inhibition bit string memory for storing said multipath identifier in an address portion and storing in a data portion, said transfer inhibition bit string indicating whether or not transfer of said received stream of packets to said transfer path corresponding to said combination of said multi-path identifier and the transfer path number is in an inhibition state, for each said transfer path number, based on said multi-path identifier;

judging whether or not the transfer of said received stream of packets to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is in the inhibition state based on the read out transfer inhibition bit string;

when the transfer of said received stream of packets to said transfer path is in the inhibition state, reading out a transfer allocation path number, based on said multi-path identifier,

from a transfer allocation path number memory for storing said multipath identifier in an address portion, and storing as said transfer allocation path number, said transfer path number corresponding to said transfer path in a data portion, based on said multi-path identifier; and updating said transfer path number from said cache transfer path number to said read out said transfer allocation path number.

60. (original): A datagram relaying method according to claim 59, wherein said step of determining a transfer path includes:

when updating said transfer path number from said cache transfer path number to said transfer allocation path number, reading out an allocation inhibition bit string, based on said multi-path identifier, from an allocation inhibition bit string memory for storing said multi-path identifier in an address portion, storing in a data portion for each said transfer path number, said allocation inhibition bit string indicating whether or not allocation of said received stream of packets to said transfer path corresponding to said combination of the transfer path number and said multi-path identifier is in the inhibition state, based on said multi-path identifier;

specifying said transfer path number in which allocation of said received stream is not in the inhibition state in the read out allocation inhibition bit string; and

updating said transfer allocation path number corresponding to said multi-path identifier in the data portion of said transfer allocation path number memory, based on the specified said transfer path number.

61. (original): A datagram relaying method according to claim 59, wherein said step of determining a transfer path includes:

reading out an allocation stream count and a maximum stream count, based on said combination of said transfer path number corresponding to said cache transfer path number and said multi-path identifier, from an allocation stream count memory for storing said multi-path identifier and said transfer path number in an address portion and storing an allocation stream count indicating the stream count being currently allocated to said transfer path number corresponding to said combination of said multi-path identifier and said cache transfer path number in a data portion, and a maximum stream count memory for storing said multi-path identifier and said transfer path number in an address portion, and storing a maximum stream count indicating the maximum stream count to be allocated to said transfer path number in a data portion, based on said combination of said multi-path identifier and said transfer path number;

comparing the read out said allocation stream count with said maximum stream count, when said allocation stream count is greater than said maximum stream count, storing in said transfer inhibition bit string, a fact that the transfer of said received stream of packets to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is in the inhibition state;

when said allocation stream count is equal to or less than said maximum stream count as said comparison result between said allocation stream count and said maximum stream count, storing in said transfer inhibition bit string, a fact that the transfer of said received stream of

packets to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is in a permission state.

62. (original): A datagram relaying method according to claims 59, wherein said step of determining a transfer path includes:

when said allocation stream count is equal to or greater than said maximum stream count as said comparison result between said allocation stream count and said maximum stream count, storing in said allocation inhibition bit string, a fact that the allocation of said received stream of packets to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is in the inhibition state; and

when said allocation stream count is less than said maximum stream count as said comparison result between said allocation stream count and said maximum stream count, storing in said allocation inhibition bit string, a fact that the allocation of said received stream of packets to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is at the permission state.

63. (original): A datagram relaying method according to claim 61, wherein said step of determining a transfer path includes:

when updating said transfer path number from said cache transfer path number to said transfer allocation path number, subtracting one from said allocation stream count corresponding

to said combination of said multi-path identifier and said transfer path number corresponding to said cache transfer path number;

adding one to said allocation stream count corresponding to said combination of said multi-path identifier and said transfer path number after said update;

comparing said subtracted allocation stream count and said added allocation stream count with said maximum stream count;

updating said transfer inhibition bit string and said allocation inhibition bit string based on the comparison result; and

specifying said transfer path number to update said transfer allocation path number stored in said transfer allocation path number memory, based on the updated transfer inhibition bit string and said allocation inhibition bit string.

64. (original): A datagram relaying method according to claim 60, wherein said step of determining a transfer path includes:

when specifying said transfer path number in which the allocation of said received stream of packets is not in the inhibition state based on said allocation inhibition bit string, defining a start value as a value next to a value of said transfer allocation path number in which said transfer path number is updated;

judging whether or not sequential allocation of said received stream of packets to said transfer path corresponding to said combination of said multipath identifier and said transfer path number is in a permission state in said allocation inhibition bit string;

when a value targeted for the determination becomes a maximum value of said transfer path number in the determination, defining a value targeted for a next determination as a minimum value of said transfer path number, judging whether or not the sequential allocation of said received stream of packets to said transfer path corresponding to said combination of said multi-path identifier and said transfer path number is in the permission state in said allocation inhibition bit string.

65. (original): A datagram relaying method according to claim 64, wherein said step of determining a transfer path includes:

when the value targeted for said determination becomes the same value as said transfer allocation path number in which said transfer path number is updated, setting said transfer path number to update said transfer allocation path number corresponding to said multi-path identifier in said transfer allocation path number memory as a transfer path number corresponding to said start value.

66. (original): A datagram relaying method according to claim 61, wherein said step of determining a transfer path includes:

when specifying said transfer path number in which the allocation of said received stream of packets is not in the inhibition state based on said transfer allocation path number, reading out said allocation stream count and said maximum stream count for each said transfer path number based on said multi-path identifier;

dividing the read out allocation stream count by said maximum stream count, to calculate an allocation rate for each said transfer path number; and

updating said transfer allocation path number stored in said transfer allocation path number memory based on said transfer path number having the smallest allocation rate.

67. (original): A datagram relaying method according to claim 60, wherein said step of determining a transfer path includes:

after updating said transfer path number based on said transfer allocation path number read out from said transfer allocation path number memory, adding one to the corresponding continuous allocation count, based on said multi-path identifier, by using a continuous allocation count memory for storing said multi-path identifier in an address portion, and storing a continuous allocation count indicating the stream count continuously allocated to said transfer path number until this time in a data portion, based on said multi-path identifier;

comparing the added continuous allocation count with said maximum continuous allocation count read out from a maximum continuous allocation count memory for storing said multi-path identifier and said transfer path number in an address portion, based on said multi-path identifier, and storing said maximum continuous allocation count indicating the maximum

stream count continuously allocated to said transfer path number in a data portion, based on said combination of said multi-path identifier and said transfer path number;

when said continuous allocation count is equal to or greater than said maximum continuous allocation count, specifying said transfer path number in which the allocation of said received stream of packets is not in the inhibition state in said allocation inhibition bit string corresponding to said multi-path; and

updating said transfer allocation path number corresponding to said multi-path identifier in the data portion of said transfer allocation path number memory based on the specified said transfer path number.

68. (original): A datagram relaying method according to claim 60, wherein said step of determining a transfer path includes:

each time said transfer path number is updated from said cache transfer path number based on said transfer allocation path number read out from said transfer allocation path number memory, updating said transfer allocation path number corresponding to said multi-path identifier in the data portion of said transfer allocation path number memory.

69. (original): A datagram relaying method according to claim 61, wherein said step of determining a transfer path includes:

when said allocation stream count corresponding to said transfer allocation path number stored in said transfer allocation path number memory reaches said maximum stream count,

updating said transfer allocation path number corresponding to said multi-path identifier in the data portion of said transfer allocation path number memory.

70. (original): A datagram relaying method according to claim 59, wherein said step of determining a transfer path includes:

when a fault occurrence report signal reporting said fault occurrence is received from a physical link, based on said channel identifier to identify said transfer path corresponding to said physical link having said fault from the fault occurrence report signal, specifying said transfer path number and said multi-path identifier, from a channel identifier memory for storing a channel identifier corresponding to said transfer path in a one-to-one relationship in an address portion, and storing said multi-path identifier and said transfer path number in a data portion, based on said channel identifier;

updating to a fault occurrence state based on the specified multi-path identifier, said operation mode stored in an operation mode memory for storing said multi-path identifier in an address portion, and storing an operation mode indicating whether or not a fault has occurred on said physical link corresponding to said transfer path in a data portion, based on said multi-path identifier;

based on said specified said multi-path identifier, storing a fact that the allocation and transfer of said received stream of packets to said specified transfer path number are in the inhibition state in said transfer path state bit string in a transfer path state bit string memory for

storing said multi-path identifier in an address portion, and storing in a data portion, a transfer path state bit string indicating whether or not the allocation and transfer of said received stream of packets to said transfer path corresponding for each said transfer path number are in the inhibition state because of said fault occurrence, based on said multi-path identifier;

when said packets are received from said protocol terminating units, reading out said operation mode corresponding based on said multi-path identifier;

when the read out operation mode indicates said fault occurrence state, reading out said transfer path state bit string based on said multi-path identifier;

judging whether or not the allocation and transfer of said received stream of packets to said transfer path number are in the inhibition state in the read out said transfer path state bit string;

when the allocation and transfer of said received stream of packets to said transfer path number are in the inhibition state, reading out said transfer allocation path number based on said multi path identifier; and

updating said transfer path number to said read out transfer allocation path number based on said cache transfer path number.

71. (original): A datagram relaying method according to claim 70, wherein said step of determining a transfer path includes:

when said read out operation mode indicates a fault occurrence state based on said multi-path identifier, reading out said transfer path state bit string based on said multi-path identifier;

specifying said transfer path number in which the allocation and transfer of said received stream of packets are not in the inhibition state in the read out said transfer path state bit string;
and

updating said transfer allocation path number corresponding to said multi-path identifier in the data portion of said transfer allocation path number memory based the specified said transfer path number.

72. (original): A datagram relaying method according to claim 59, wherein said transfer path number corresponds to each of said transfer paths different from each other in a one-to-one relationship, and is further constituted of the same data as the corresponding said transfer path, and said step of determining a transfer path includes:

when said fault occurrence report signal reporting said fault occurrence is supplied from said physical link, specifying said transfer path corresponding to said physical link having said fault from said fault occurrence report signal;

storing a fact that the allocation and transfer of said received stream of packets to said specified said transfer path are in the inhibition state, in said transfer path state bit string indicating whether or not the allocation and transfer of said received stream of packets to each of said transfer paths and each of said transfer path numbers;

when the packet is received from said protocol terminating units, based on said multi-path identifier, reading out the corresponding usage path bit string from a usage path bit string memory for storing said multi-path identifier in an address portion, and storing a usage path bit

string indicating one or more said transfer paths corresponding to the multi-path identifier in a data portion, based on said multi-path identifier;

judging a presence or absence of said transfer path which is used in the read out said usage path bit string and in which the allocation and transfer of said received stream of packets are in the inhibition state in said transfer path state bit string;

in the case of the presence of said transfer path which is used in said usage path bit string and in which the allocation and transfer of said received stream of packets are in the inhibition state in said transfer path state bit string, judging whether or not the allocation and transfer of said received stream of packets to said transfer path number corresponding to said cache transfer path number are in the inhibition state based on said transfer path state bit string;

when the allocation and transfer of said received stream of packets to said transfer path number are in the inhibition state, reading out said transfer allocation path number based on said multipath identifier; and

updating said transfer path number based on the read out transfer allocation path number based on said cache transfer path number.

73. (original): A datagram relaying method according to claim 72, wherein said step of determining a transfer path includes:

in the case of the presence of said transfer path and said transfer path number which are used in said usage path bit string and in which the allocation and transfer of said received stream of packets are in the inhibition state in said transfer path state bit string, specifying said transfer

path number in which the allocation and transfer of said received stream of packets are not in the inhibition state in said transfer path state bit string; and

updating said transfer allocation path number corresponding to said multi-path identifier in the data portion of said transfer allocation path number memory based on the specified transfer path number.

74. (original): A datagram relaying method according to claim 59, wherein said cache transfer path number further has a bit different from a bit indicating the corresponding said transfer path number, the different bit stores therein a registration state bit indicating whether or not said cache transfer path number is in a non-registered state, and

said step of determining a transfer path includes:

determining whether or not said cache transfer path number is in the non-registered state based on said different bit; and

when said cache transfer path number is in the non-registered state, updating said transfer path number from said cache transfer path number to said transfer allocation path number.

75. (original): A datagram relaying method according to claim 59, wherein said cache transfer path number is composed of said predetermined bit pattern, when said transfer path number corresponding to said combination of said stream identifier and said multi-path identifier is in the non-registered state, and

said step of determining a transfer path includes:

determining whether or not said cache transfer path number defined as said transfer path number is composed of said predetermined bit pattern which is stored in advance;

determining whether or not said cache transfer path number is in the non-registered state;
and

when said cache transfer path number is in the non-registered state, updating said transfer path number from said cache transfer path number to said transfer allocation path number.

76. (original): A datagram relaying method according to claim 59, wherein said step of determining a transfer path includes:

after specifying said transfer path number to update said transfer allocation path number stored in said transfer allocation path number memory, based on the specified said transfer path number, updating said cache transfer path number corresponding to said combination of said multi-path identifier and said stream identifier in a data portion of said cache transfer path number memory.

77. (original): A datagram relaying method according to claim 59, wherein said transfer inhibition bit string is composed of the number of bits equal to or greater than kinds of said transfer path numbers divided by the corresponding multi-path identifier, and in each of the respective bits constituting said transfer inhibition bit string, each of the respective bits corresponds to said transfer path number divided by said multi-path identifier in a one to-one relationship, and

said step of determining a transfer path includes:

storing a fact that the transfer of said received stream of packets to said transfer path corresponding to the corresponding transfer path number for each said bit is in the inhibition state.

78. (original): A datagram relaying method according to claim 60, wherein said allocation inhibition bit string is composed of the number of bits equal to or greater than kinds of said transfer path numbers divided by the corresponding multi-path identifier, and

in each of the respective bits constituting said allocation inhibition bit string, each of the respective bits corresponds to said transfer path number divided by said multi-path identifier in a one to-one relationship, and said step of determining a transfer path includes:

storing a fact that the allocation of said received stream of packets to said transfer path corresponding to said corresponding transfer path number for each said bit is in the inhibition state.

79. (original): A datagram relaying method according to claim 70, wherein said transfer path state bit string is composed of the number of bits equal to or greater than kinds of said transfer path numbers divided by the corresponding multi-path identifier, and

in each of the respective bits constituting said transfer path state bit string, each of the respective bits corresponds to said transfer path number divided by said multi-path identifier in a one to-one relationship, and said step of determining a transfer path includes:

storing a fact that the allocation and transfer of said received stream of packets to said transfer path corresponding to the corresponding transfer path number for each said bit are in the inhibition state.

80. (original): A datagram relaying method according to claim 72, wherein said transfer path state bit string is composed of the number of bits equal to or greater than kinds of said transfer path numbers, and

in each of the respective bits constituting said transfer path state bit string, each of the respective bits corresponds to said transfer path and said transfer path number in a one-to-one relationship, and

said step of determining a transfer path includes:

storing a fact that the allocation and transfer of said received stream of packets to the corresponding transfer path and said transfer path number for each said bit are in the inhibition state.

81. (original): A datagram relaying method according to claim 74, further comprising:

detecting said combination of said transfer path number and said multi-path identifier corresponding to said transfer path to which said received stream of packets is not transferred for a predetermined time; and

setting said cache transfer path number stored in the data portion of said cache transfer path number memory corresponding to said combination of said transfer path number and the detected multi-path identifier, to a non-registered state.

82. (original): A datagram relaying method according to claim 81, wherein said step of determining a transfer path includes:

subtracting one from said allocation stream count corresponding to said detected combination of said transfer path number and said multi-path identifier to which said received stream of packets is not transferred for said predetermined time; and

updating said transfer inhibition bit string and said allocation inhibition bit string, based on the subtracted allocation stream count and said maximum stream count.